Clinton Power Station
8401 Power Road
Clinton, IL 61727

Exelon Generation®

U-604466

10 CFR 50.73
SRRS 5A.108

January 17, 2019

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Licensee Event Report 2017-010-02

Enclosed is Licensee Event Report (LER) 2017-010-02: Division 1 Transformer Failure Leads to Instrument Air Isolation to Containment Requiring a Manual Reactor Scram. This is a supplemental report to LER 2017-010-01 submitted to the NRC on August 3, 2018. The updated information in the LER is denoted by revision bars located in the right-hand margin. This report is being submitted in accordance with the requirements of 10 CFR 50. 73.

There are no regulatory commitments contained in this report.

Should you have any questions concerning this report, please contact Mr. Dale Shelton, Regulatory Assurance Manager, at (217) 937-2800.

Respectfully,

Theodore R. Stoner
Site Vice President
Clinton Power Station

kp/lam

Attachment: License Event Report 2017-010-02

cc:

Regional Administrator - Region III
NRC Senior Resident Inspector - Clinton Power Station
Office of Nuclear Facility Safety - Illinois Emergency Management Agency

IE22
NRR

NRC FORM 366 (04-2018) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name	2. Docket Number	3. Page
Clinton Power Station, Unit 1	05000461	1 OF 4

4. Title

Division 1 Transformer Failure Leads to Instrument Air Isolation to Containment Requiring a Manual Reactor Scram

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
12	09	2017	2017	- 010	- 02	01	18	19		05000
									Facility Name	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☒ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
097	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☒ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☒ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Mr. Dale Shelton, Regulatory Assurance Manager	(217) 937-2800

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
X	ED	XFMR	G184	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On December 9, 2017 at 1347 CDT the Main Control Room received annunciators that indicated a trip of a 4160V 1A1 Breaker (1AP07EJ), 480V transformer 1A and A1 feed breaker. The loss of Division 1 480V power caused the Instrument Air (IA) containment isolation valves to fail close as designed. The loss of IA affected various containment loads, including the scram pilot air header and containment isolation valves. Another consequence of this event was that secondary containment (SC) vacuum was not maintained within Technical Specification (TS) limits due to Fuel Building ventilation dampers failing closed by design due to the loss of power. In addition, this event resulted in the inoperability of the Low Pressure Core Spray System (a single train safety system) and inoperability of primary containment due to primary to secondary containment differential pressure being outside TS limits. Operations entered Emergency Operating Procedure (EOP) -08, Secondary Containment Control. Division 2 Standby Gas Treatment System was activated at 1350 and restored SC vacuum within allowable TS values at 1351 and the EOP was exited. Due to the loss of IA, a manual reactor scram was inserted at 1353 when two control rods began drifting in as expected. A phase to ground fault was identified on 480V transformer 1A (1AP11E). On December 14, 2017, the 480V transformer was replaced and the plant returned to Mode 1 operations on December 15, 2017. The condition described in this report was determined to be reportable under 10 CFR50.73(a)(2)(iv)(A), 10 CFR 50.73(a)(2)(v)(C), 10 CFR 50.73 (a)(2)(ii)(B) and 10 CFR 50.73 (a)(2)(v)(D). Based on analyses performed at vendor test facilities following the event, the cause of the transformer failure was determined to be excessive layer to layer design stress within the 4160V winding. The identification of a pre-existing design defect during the cause analysis also resulted in the issuance a 10 CFR Part 21 notification to the NRC. This event is classified as an unplanned scram with complications due to the loss of Div. 1 480 power.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Clinton Power Station, Unit 1	05000461	2017	- 010	- 02

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION
General Electric -- Boiling Water Reactor, 3473 Megawatts Thermal Rated Core Power
Energy Industry Identification System (EIIS) codes are identified in text as [XX].

EVENT IDENTIFICATION
Division 1 Transformer Failure Leads to Instrument Air Isolation to Containment Requiring a Manual Reactor Scram

A. Plant Operating Conditions Before the Event

Unit: 1 Event Date: 12/09/17 Event Time: 1347
Mode: 1 Mode Name: Power Operation Reactor Power: 97 percent

B. Description of Event

At 1347 CDT on December 9, 2017, the Main Control Room received annunciators that indicated a trip of the 4160V [EB] 1A1 breaker [BKR]1AP07EJ and the loss of 480V unit substations 1A and A1. Numerous Division 1 components lost 480V power (powered from unit substations 1A and A1) including the scram pilot air header isolation valves and the reactor water cleanup system. The Division 1 containment Instrument Air isolation valves had failed closed by design due to the loss of power. Due to the loss of containment instrument air, several control rods began to drift into the core as expected and, by procedure, a manual reactor scram was performed at 1353.

Due to the loss of power, the Fuel Building ventilation dampers failed closed by design. With the normal ventilation system secured, secondary containment vacuum rose to slightly greater 0 inches water gauge which exceeded the Technical Specification (TS) Surveillance Requirement (SR) 3.6.4.1.1 limit of greater than or equal to 0.25 inches vacuum water gauge at 1348. The Control Room entered Emergency Operating Procedure-8, Secondary Containment Control. Another consequence of this event was that primary containment to secondary containment differential pressure exceeded the limits of TS 3.6.1.4, "Primary Containment Pressure." In addition, the Low Pressure Core Spray System (a single train safety system) was declared inoperable due to the loss of power and TS Limiting Condition for Operation (LCO) 3.5.1, "ECCS-Operating," Action A.1 was entered. Secondary Containment vacuum was restored within TS requirements at 1351 by starting the Division 2 Standby Gas Treatment System (SGTS).

Inspection of 480V transformer 1A (1AP11E) found an area on the upper end of the B phase coil that was consistent with a phase to ground fault.

On December 14, 2017, the transformer was replaced and the plant returned to Mode 1 operations on December 15, 2017.

This event is reportable under 10 CFR 50.73(a)(2)(iv)(A) as a manual actuation of the Reactor Protection System (RPS), 10 CFR 50.73(a)(2)(v)(C) as a condition that could have prevented the fulfillment of a safety function needed to control the release of radioactive material, 10 CFR 50.73(a)(2)(v)(D) as a condition that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident and 10 CFR 50.73 (a)(2)(ii)(B) as an event that resulted in the plant being in an unanalyzed condition that significantly degraded plant safety.

The event described in this report is considered an unplanned scram with complications due to the loss of the Division 1 480V power.

C. Cause of the Event

Based on analyses performed at vendor test facilities following the event, the cause of the transformer failure was determined to be excessive layer to layer design stress within the 4160V winding of a Gould Brown Boveri (GBB) dry type 4160/480V safety related transformer. This pre-existing design defect resulted in the issuance of a 10 CFR Part 21 notification to the NRC.

D. Safety Consequences

The trip of 4160V circuit breaker 1AP07EJ and the failure of the 480V transformer 1AP11E placed the station in a potential scram condition due to loss of Instrument Air to the containment and the scram pilot air header. Manual operator actions were taken to shut down the reactor prior to an automatic scram and place the plant in a safe and stable condition. The loss of Division 1 480V power caused the Fuel Building Ventilation System to isolate resulting in secondary containment vacuum to rise greater than 0 inches water gauge and primary containment differential pressure to exceed the initial conditions assumed in the accident analysis, resulting in the plant being in an unanalyzed condition. Operators placed the Division 2 SGTS in service to restore secondary containment vacuum. Once the plant reached Mode 4, Cold Shutdown, the containment airlock was defeated to restore primary containment differential pressure to within limits. All Division 2 and Division 3 Emergency Core Cooling Systems remained operable and available throughout this event for accident mitigation if required. No plant safety limits were exceeded and no Emergency Core Cooling System actuations occurred.

NARRATIVE

E. Corrective Actions

On December 14, 2017, the faulted transformer was replaced and the plant returned to Mode 1 operations on December 15, 2017. Safety and non-safety related Gould Brown Boveri (GBB) 4160V dry type transformers which could lead to the plant entering a forced shutdown condition or having high operational impact were replaced in the following refueling outage C1R18. Transformers were replaced with an improved design transformer which does not have layer to layer design stress in excess of the current insulation manufacturer's recommendations.

F. Previous Similar Occurrences

LER 2013-008-01 Failure of Division 1 Transformer Leads to Isolation of Instrument Air Supply to Containment, Lowering Scram Pilot Air Header Pressure, and Manual Reactor Scram

On December 8, 2013 at 2026 hours with the plant in Mode 1 at 97.3 percent reactor power, operators received multiple alarms due to the trip of 4160V 1A1 breaker 1AP07EJ which resulted in a loss of power to Division 1 480V unit substations 1A and A1. Operators were immediately dispatched and found a 4160/480V stepdown transformer A1 (0AP05E) failed. Many Division I components lost power. The loss of power caused an Instrument Air containment isolation. The loss of Instrument Air affected various containment loads, including the scram pilot air header, the main steam isolation valves and the reactor water cleanup system. At 2036 hours, the scram pilot air header low pressure alarm was received and in response to an anticipated automatic reactor scram, operators immediately initiated a manual reactor scram. All control rods fully inserted into the core.

The cause of the transformer failure was a turn to turn failure of the high side windings due to insulation breakdown over time, prior to its expected end of life. An installed spare was connected to replace the failed Division 1 transformer.

G. Component Failure Data

Component Description: I-T-E Dry Type Transformer; 4160V/480V; 750KVA,
Manufacturer: GOULD-BROWN-BOVERI